# NIGHT SCAN UNIVERSAL REMOTE CONTROL SYSTEM
# OPERATOR'S MANUAL

nightscan®

The Will-Burt Company
169 S. Main Street
Orrville, OH 44667

(P/N: 5543601Shown)

www.willburt.com
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Original Instructions

# Warranty

Will-Burt warrants its Night Scan® Universal Remote Control System to be free from defects in material and workmanship for a period of two (2) years, with such time period running from the date of shipment by Will-Burt. Will-Burt shall not be responsible for any damage resulting to or caused by its products by reason of failure to properly install, maintain or store the product; use of the product in a manner inconsistent with its design; unauthorized service, alteration of products, neglect, abuse, accident, or acts of God. This warranty does not extend to any component parts not manufactured by Will-Burt; provided, however, Will-Burt's warranty herein shall not limit any warranties by manufacturers of component parts which extend to the buyer.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, AND NO REPRESENTATIONS, GUARANTEES OR WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO, A WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT ARE MADE BY WILL-BURT IN CONNECTION WITH THE MANUFACTURE OR SALE OF ITS PRODUCTS. NO EMPLOYEE, DISTRIBUTOR, OR REPRESENTATIVE IS AUTHORIZED TO CHANGE THIS WARRANTY IN ANY WAY OR GRANT ANY OTHER WARRANTY ON BEHALF OF WILL-BURT.

Claims for defects in material and workmanship shall be made in writing to Will-Burt within thirty (30) days of the discovery of defect. Failure to provide notice as required hereby shall be conclusive evidence that the product was in conformity with the warranty, and Will-Burt shall be released from any and all liability relating to the product. Will-Burt may either send a service representative or have the product returned to its factory at Buyer's expense for inspection. If judged by Will-Burt to be defective in material or workmanship, the product will be replaced or repaired at the option of Will-Burt, free from all charges except authorized transportation.

THE REMEDIES OF BUYER SET FORTH HEREIN ARE EXCLUSIVE AND ARE IN LIEU OF ALL OTHER REMEDIES. THE LIABILITY OF WILL-BURT WHETHER IN CONTRACT, TORT, UNDER ANY WARRANTY, OR OTHERWISE, SHALL NOT EXTEND BEYOND ITS OBLIGATION TO REPAIR OR REPLACE, AT ITS OPTION, ANY PRODUCT OR PART FOUND BY WILL-BURT TO BE DEFECTIVE IN MATERIAL OR WORKMANSHIP. WILL-BURT SHALL NOT BE LIABLE FOR COST OF INSTALLATION AND/OR REMOVAL, OR BE RESPONSIBLE FOR DIRECT, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES OF ANY NATURE.

# Document History

| Document Numbers | Dates | Remarks |
|---|---|---|
| TP-5543301-00 | July 11, 2018 | Initial Release |
| TP-5543301-A | July 13, 2018 | Updated Figure 2-2 |
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# Safety Summary

This section describes safety precautions for the Night Scan Universal Remote Control System. These are recommended precautions that personnel must understand and apply throughout many phases of installation and operation. Be sure the read and understand that entire manual, and contact The Will-Burt Company with any questions, before performing any procedure outlined in this manual.

For precautions pertaining to the Night Scan mast, see your Night Scan manual.

## Signal Word Definitions

Per the ANSI Z535.4 standard, the following signal words and definitions are used to indicate hazardous situations:

**⚠ DANGER**

DANGER indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.

**⚠ WARNING**

WARNING indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

**⚠ CAUTION**

CAUTION indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury. It is also used to alert against unsafe practices.

## General Safety Precautions

The following are general safety precautions that are not related to any specific procedures. These are recommended precautions that personnel must understand and apply throughout installation, operation, maintenance, and troubleshooting.

**⚠ DANGER**

**Electrocution Hazard!** Contact with high voltage will result in death or serious injury. Observe general safety precautions for handling equipment using high voltage. Do not locate or operate mast near electrical lines, cables or other unwanted sources of electricity. Be sure to allow sufficient clearance on all sides of the mast to allow for side sway. Do not operate mast in lightning. Be certain electrical cables are undamaged and properly terminated. Always disconnect power before performing service, repair or test operations.

**⚠ WARNING**

**Safety Instruction – Trained Personnel Only!** Death or serious injury could result if proper inspection, installation, operation and maintenance procedures are not observed. Installation, operation and maintenance to be performed by trained and authorized personnel only. Proper eye protection should be worn when servicing the mast.

**⚠ WARNING**

**Safety Instruction – Read Manual!** Failure to follow operating instructions could result in death or serious injury. Read and understand the operator's manual before using the mast.

**⚠ WARNING**

**Safety Equipment!** Helmets or hard hats, eye protection, gloves, and safety shoes must be properly worn while working in the deployment area. Death or serious injury could result if proper safety equipment is not properly worn.

**⚠ WARNING**

**Tip Over Hazard!** Mast tip over could result in death or serious injury. Do not operate in high winds. Operate on level ground only. Stand clear of mast and mast payload during operation. Be certain mast is level and secure before and during installation, operation, and maintenance.

**⚠ WARNING**

**Safety Instruction – Resuscitation Alert!** Personnel working with or near high voltages should be familiar with modern methods of resuscitation. Such information may be obtained from the Bureau of Medicine and Surgery.

**⚠ WARNING**

**Health and Safety Hazard!** Solvent used to clean parts is potentially dangerous. Avoid inhalation of fumes and also prolonged contact to skin.

**⚠ WARNING**

**Safety Instruction – Do not look at lights!** Do not look directly into lights when they are illuminated. Temporary impairment or permanent vision damage could occur.

## Specific Safety Precautions

The following are safety precautions that are related to specific procedures and therefore appear elsewhere in this publication for emphasis. These are recommended precautions that personnel must understand and apply during specific phases of installation, operation and maintenance.

**⚠ WARNING**

**Trained Personnel Only!** Only trained and qualified personnel should perform installation procedures. Only a properly trained and qualified certified electrician should perform electric installations. Death or serious injury could result if proper installation procedures are not observed.

**⚠ WARNING**

**Safety Instruction – Mounting Instructions!** Be sure to understand all mounting instructions. The mounting hardware must include proper means to resist vibration loosening such as thread-locking compound or locking hardware. Failure to follow mounting instructions can result in death or injury.

**⚠ WARNING**

**Mounting Structure Hazard!** Before operation, be certain the mounting structure is capable of resisting forces generated from all loading and environmental conditions including, but not limited to system size and weight, payload size and weight, sail size, wind speed, and ice loading. The mounting hardware must include proper means to resist vibration loosening such as thread-locking compound or locking hardware. Mounting the system to a structure unable to resist the forces generated from customer-specific loading scenario could result in death or serious injury and could damage the system.

**⚠ WARNING**

**Mast Extension Hazard!** Extending mast into obstructions could result in death or serious injury and could render the mast inoperable and partially extended. Before applying power and operating the mast, be certain there is sufficient clearance above and to all sides of the expected location of the fully extended mast and payload. Keep all persons clear of mast and mast extension. Do not lean directly over the mast.

**⚠ WARNING**

**Relocation Hazard!** Relocating the mast during operation or after extension could result in death or serious injury. Do not relocate the mast during operation or while extended. This applies especially to masts mounted to vehicles. Operate the mast only if the vehicle is stationary and the vehicle engine is off.

**⚠ WARNING**

**Safety Instruction – Operation!** For outdoor use only. Do not use in areas that have been classified as hazardous as defined in Article 500 of the National Electric Code.

**⚠ WARNING**

**Safety Instruction – Keep Clear!** Keep personnel clear of the Mast System during operation.

**⚠ WARNING**

**Fire Hazard!** Do not use in the presence of flammable gases or liquids such as paint, gasoline or solvents. Do not use in areas of limited ventilation or where high ambient temperatures are present. Contact with combustible materials can cause ignition resulting in fire or explosion.

**⚠ WARNING**

**Temperature!** During charging, the ambient temperature needs to be between 41°F and 113°F (5°C and 45°C).

**⚠ WARNING**

**Safety Instruction – Power!** Make sure all power has been disconnected prior to performing maintenance.

**⚠ WARNING**

**Batteries!** If using non-rechargeable batteries, do not use the charger.

**⚠ WARNING**

**Damage!** Never use acids, alcohol, or thinner when cleaning the Night Scan Wireless Remote Control System as these may dry up gaskets, significantly reducing the capacity to prevent water/moisture ingress. Never use high-pressure to clean the Night Scan Wireless Remote Control System as this may shorten the lifespan of the product or damage it.

**⚠ CAUTION**

**Safety Instruction – Roof Access!** If mast will be mounted to a vehicle, the operator must provide safe means to access the roof of the vehicle during installation and maintenance.

**⚠ CAUTION**

**Equipment Damage – Qualified Personnel!** All persons installing and maintaining this equipment should be suitably qualified and work to local, regional, and national standards and codes of practice.

**⚠ CAUTION**

**Equipment Damage – Obstruction!** Check for and remove any objects that might obstruct motion, cause binding, or hinder function of the Mast System. Hitting obstructions will cause damage to the mast.

**⚠ CAUTION**

**Equipment Damage – Deviation!** Deviation from standard operating conditions and procedures could cause system failure.

# Section 1 Introduction

Review this manual in its entirety. Contact The Will-Burt Company with any questions before performing any procedure outlined in this manual. The views depicted in this manual are provided for clarification and are subject to change without notice. Views are not to scale.

This manual describes installation, operation, and maintenance for the Night Scan Universal Remote Control System.

This manual does not cover the installation, operation, and maintenance for the Night Scan mast (e.g. Night Scan Chief, Night Scan Powerlite, or Night Scan Vertical).

## 1.1 Safety Precaution Notification

Refer to the Safety Summary for precautions to be observed while installing, operating, or maintaining this equipment.

## 1.2 Manual Organization

This manual is organized into the following sections:

Section 1 Introduction

Section 2 Installation

Section 3 Operation

Section 4 Maintenance

Section 5 Troubleshooting

## 1.3 Additional Documentation

In addition to this manual (TP-5543301), see the operator's manual for your Night Scan mast. During installation, operation, and maintenance, be sure to follow all appropriate precautions from your Night Scan mast operator's manual.

For additional troubleshooting information, *Night Scan Product Troubleshooting Guide*.

If necessary, contact The Will-Burt Company to obtain these documents.

## 1.4 Definitions of Terms

Throughout this manual, the following terms are used:

- "Extended" refers to the partial- or fully-raised position that the mast pneumatically goes to from the stowed position. In the extended position, some or all of the mast sections have risen.
- "LED" stands for Light Emitting Diode.
- "Mounting Structure" refers to the overall structure where the Control Box is mounted.
- "Night Scan mast" refers to the transportable lighting system that the Night Scan Wireless HHRC operates (e.g. Night Scan Chief, Night Scan Powerlite, or Night Scan Vertical)
- "Night Scan Universal Remote Control System" refers to the entire wireless control system (Control Box, Wireless HHRC, harness, and optional accessories).
- "RCP" stands for Remote Controlled Positioner.
- "Stowed" refers to the position of the mast when the mast is completely retracted. This position is sometimes referred to as the "nested" position.
- "Wireless HHRC" refers to the Night Scan Wireless Hand-Held Remote Controller

## 1.5 Specifications

Table 1-1 lists specifications for the Night Scan Universal Remote System.

*Table 1-1 Night Scan Universal Remote System Specifications*

| Functional Characteristic | Specification* |
|---|---|
| Night Scan Universal Remote Control System | |
| Operating Temperature Range | -22° to 149°F (-30° to 65° C) |
| Approximate Weight (Entire System) | 7.8 lb. (3.5 kg) |
| Communications Interface | Direct |
| Communications Frequency | 2.4 GHz |
| Wireless Hand-Held Remote Controller | |
| Approximate Weight | 0.88 lb. (400 g) including batteries |
| Housing Material | Plastic PC |
| Ingress Protection (IP) Rating | IP65 |
| Ambient Operating Temperature Range | -15°F to 130°F (-25°C to 55°C) |
| Operating Time | Up to 40 hours of operation (depending on usage of LED and display) |
| ISO-13849 for Stop Function | Category 3, PL d |

* Note:
- Communication frequency is U.S. legal. Customer is responsible for ensuring remote frequency is legal in country of use.
- Dimensions and specifications are provided for reference only and are not intended for vehicle design purposes.
- Optional Wired HHRC specifications not included.
- Specifications may be subject to change without notice.

## 1.6 Major Components

The major components of the system are:

- Control Box (P/N: 5543401)
  - Wireless Hand-Held Remote Controller (HHRC) (P/N: 5518401)
  - Cradle (P/N: 5518403)
- Harness (P/N: 5543501)
- Wired Hand-Held Remote Controller (HHRC) (Optional; Not Shown) (P/N: 4361201)


*Figure 1-1 Night Scan Universal Remote Control System*

## 1.6.1 Control Box

The Control Box (Figure 1-2):

- Has an integrated emergency stop button
- Has a charging Cradle (P/N: 5518403)
- Allows the use of an optional wired HHRC


*Figure 1-2 Control Box*

### 1.6.1.1 Wireless Hand-Held Remote Controller (HHRC)

The Wireless HHRC (Figure 1-3):

- Is used for wireless control of a Night Scan mast
- Is lightweight, impact and water resistant hand-held remote controller
- Uses an rechargeable internal power source
- Has an integrated emergency stop button
- Had three LEDs (light-emitting diodes) to indicate when the Wireless HHRC has a signal, has a low battery, or is charging
- Has a 128x64 pixel monochrome OLED (organic light-emitting diode) display
- Has a backside belt clip for convenient attachment on the operators belt
- Uses an automated frequency jumping technology to ensure a reliable radio transmission that is resistant to interference


*Figure 1-3 Wireless HHRC*

### 1.6.1.2 Cradle

The Cradle is used to charge the Wireless HHRC. If desired, the customer may order an additional Cradle (P/N: 5518403) to allow the Wireless HHRC to be charged in a different location than the Control Box.


*Figure 1-4 Cradle*

## 1.6.2 Harness

The Harness is used to electrically connect the Control Box to customer power and to the Night Scan mast.

## 1.6.3 Wired Hand-Held Remote Controller (HHRC) (Optional)

The Control Box allows for the use of an optional Wired Hand-Held Remote Controller (Figure 1-5) by plugging the Wired HHRC into the terminal on the Control Box.


*Figure 1-5 Wired Hand-Held Remote Controller*

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# Section 2 Installation

This section describes the installation of the Night Scan Universal Remote Control System and provides general procedures that must be followed to ensure a successful installation. Use care to understand and follow all precautions while installing.

## 2.1 Pre-Installation Check

Before installing the Night Scan Universal Remote Control System, ensure:

- All installers read and understand the entire installation procedure
- All components are included (Section 1.6)
- All required equipment is readily available (Section 2.2)
- The mounting structure is level with sufficient room to mount the system (Section 2.5.1.1)
- The vehicle is stationary
- That the following precautions are understood and followed:

**⚠ WARNING**

**Mounting Structure Hazard!** Before operation, be certain the mounting structure is capable of resisting forces generated from all loading and environmental conditions including, but not limited to system size and weight, payload size and weight, sail size, wind speed, and ice loading. The mounting hardware must include proper means to resist vibration loosening such as thread-locking compound or locking hardware. Mounting the system to a structure unable to resist the forces generated from customer-specific loading scenario could result in death or serious injury and could damage the system.

**⚠ WARNING**

**Trained Personnel Only!** Only trained and qualified personnel should perform installation procedures. Only a properly trained and qualified certified electrician should perform electric installations. Death or serious injury could result if proper installation procedures are not observed.

**⚠ WARNING**

**Safety Instruction – Mounting Instructions!** Be sure to understand all mounting instructions. The mounting hardware must include proper means to resist vibration loosening such as thread-locking compound or locking hardware. Failure to follow mounting instructions can result in death or injury.

**⚠ CAUTION**

**Safety Instruction – Roof Access!** If mast will be mounted to a vehicle, the operator must provide safe means to access the roof of the vehicle during installation and maintenance.

**⚠ CAUTION**

**Equipment Damage – Qualified Personnel!** All persons installing and maintaining this equipment should be suitably qualified and work to local, regional, and national standards and codes of practice.

## 2.2 Installation Equipment

Table 2-1 lists equipment recommended for installation.

*Table 2-1 Equipment Recommended for Installation*

| Recommended Equipment* | | | |
|---|---|---|---|
| Personal Protective | | | |
| | Safety Glasses | Work Gloves | Nitrile or Vinyl Gloves |
| | Hearing Protection | Hard Hat or Helmet | Safety Shoes |
| Hand Tools | | | |
| | Appropriate Hardware (Section 2.3) | Drill | Level |
| | Torque Wrench | Wrenches | Washers or Spacers (For Shimming) |

* Note:
- Depending on the local, regional, and national standards and codes of practice, and the environment, additional personal protective equipment may be necessary.
- Additional equipment, including but not limited to electrical components (e.g. wire, switches, fuses, circuit breakers, etc.), may be required.
- When disposing of any disposables or components, do so according to any applicable local, regional, and national standards and codes of practice.

## 2.3 Installation Hardware

Table 2-2 describes hardware that may be used during installation.

*Table 2-2 Installation Hardware*

| Hardware* | Supplied By | Notes |
|---|---|---|
| Control Box to Mounting Structure | | |
| (4) M7 (¼″) Sets of Hardware | Customer | The screws should be sized to length to allow for the thickness of the Control Box, mounting structure, any shims, and all mounting hardware (e.g. flat washers, lock washers, and nuts). |

* Unless otherwise indicated, the mounting hardware must include proper means to resist vibration loosening such as thread-locking compound or locking hardware. Torque all hardware as appropriate for its size and grade. Additional hardware may be required for additional accessories, or customer-specific applications.

## 2.4 Installation Dimensions

Figure 2-1 lists installation dimensions for the system.

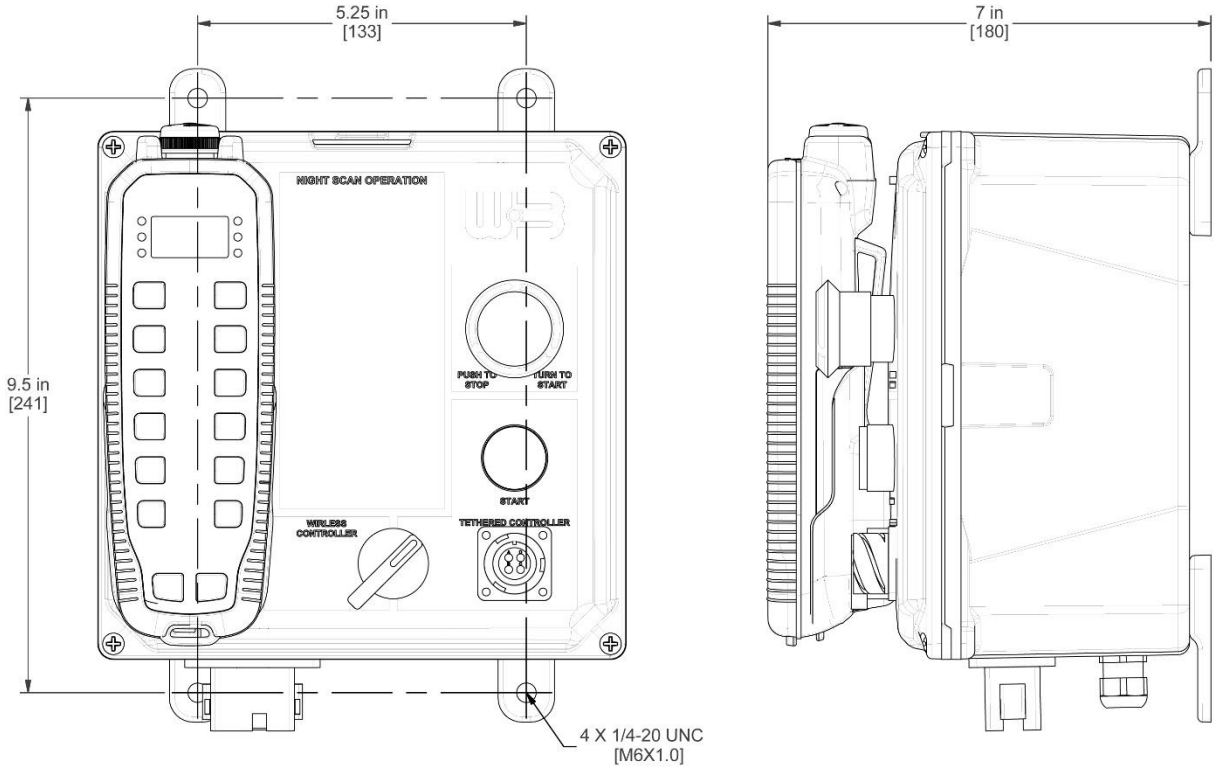



*Figure 2-1 Installation Dimensions*

# 2.5 Night Scan Universal Remote Control System Installation

This section describes how to install the Night Scan Universal Remote Control System. The exact installation procedures may vary based on the installation environment. Hardware for installing is not included with the Night Scan Universal Remote Control System.

These instructions assume that the mounting hole locations are not pre-drilled and that the Control Box will be used as a template to drill these holes during installation. Alternatively, the mounting hole locations could be found and pre-drilled using the installation dimensions (Section 2.4). When pre-drilling the mounting holes, use care to ensure the mounting holes properly align.

### 2.5.1.1 Select a Suitable Mounting Location

To select a suitable mounting location, consider the following:

- The mounting structure must have sufficient room to mount the system.
- The mounting structure must be level in all directions, solid, and capable of holding the forces required by the bolts. Check the strength and rigidity of the mounting structure where the system is to be attached. Reinforce as necessary.
- The Control Box should be placed in a dry location where the operator is most likely to be if an emergency stop is required.
- Ensure the installation site allows cables to route between components without being damaged. Cables will eventually need routed between the:
    - Control Box and the Night Scan mast
    - Control Box and customer power

### 2.5.1.2 Unpack the Night Scan Universal Remote Control System

Unpack the Night Scan Universal Remote Control System as follows:

1. Carefully open the box.
2. Inspect for any shipping damage. Notify the carrier if damage is evident.
3. Remove all loose components.

### 2.5.1.3 Install the Control Box

To install the Control Box:

1. Use the Control Box as a template and drill four holes into the mounting structure.
2. Attach the Control Box using four M7 (¼″) fasteners. Torque all hardware as appropriate for its material and size. The mounting hardware must include proper means to resist vibration loosening such as thread-locking compound or locking hardware.

### 2.5.1.4 Wire the Control Box

This section describes wiring the Night Scan Universal Remote Control System. For wiring for your Night Scan mast, see your Night Scan manual. The Control Box requires a constant 12V power source separate from the Night Scan mast. This customer power source is required for wireless remote operation and charging of the Wireless HHRC.

To wire the Control Box (Figure 2-2):

1. Ensure power is removed from the system.
2. Loosen the screws from the cover of the Night Scan mast base.
3. Remove the Night Scan base cover.
4. Run the Night Scan Universal Remote Control System Harness to the Base Board Universal Control Board (P/N: 4311701) for the Night Scan mast.
5. Connect the Harness to J4 on the Base Board.
6. Replace the base cover.
7. Run customer power (9-36 VDC) to the Deutsch connector (DT15-12PA) on the Control Box.
8. Run the Harness to the Control Box.
9. Plug the Deutsch connector (DT06-12SA) from the Harness into the Deutsch connector (DT15-12PA) on the Control Box.
10. As desired, connect the optional Wired HHRC into the terminal on the Control Box.

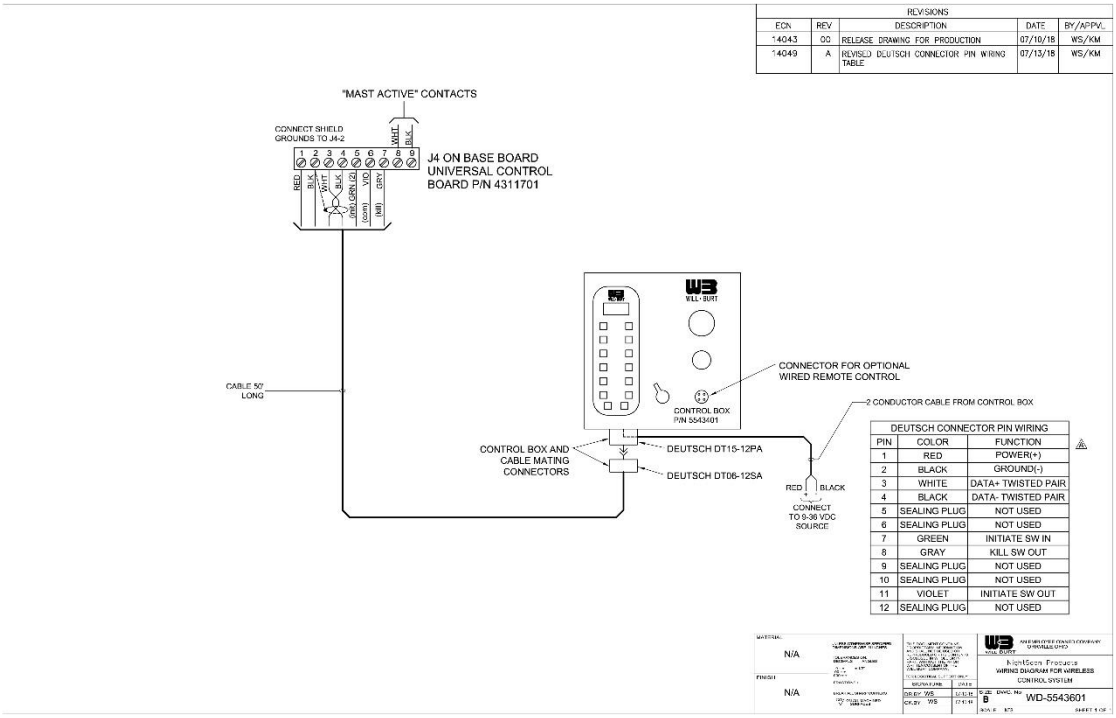



*Figure 2-2 Wiring Diagram (WD-5543601)*

## 2.6 Test the Installation

Follow all precautions while testing the Night Scan Universal Remote Control System installation. See Section 3 for additional details on these procedures.

To test the installation:

1. Review the Pre-Operation Check (Section 3.1).
2. Ensure the vehicle parking brake is engaged.
3. Ensure there are no obstructions overhead.
4. Ensure the Selector Switch is in the "WIRELESS CONTROLLER" position.

   Note: For operation with the optional Wired HHRC, move the Selector Switch to the "TETHERED CONTROLLER" position.
5. Ensure the "E-STOP" buttons on both the Wireless Remote and Control Box are pulled out.
6. Press the green "START/ON" button until "READY" is shown on the Display.
7. Extend the mast.
8. Turn the lights on and off.
9. Pan and tilt the light banks.
10. If an optional strobe/beacon light is equipped, turn the strobe/beacon light on and off.
11. Stow the mast.

# Section 3 Operation

This section describes general operation of the Night Scan Universal Remote Control System. Use care to understand and follow all precautions while operating.

## 3.1 Pre-Operation Check

Before operating the Night Scan Universal Remote Control System, ensure:

- All operators read and understand the entire operation procedure and are properly trained.
- All electrical cables are undamaged and properly terminated.
- The area is free of power lines or other overhead obstructions. The Mast System location should be no closer than a horizontal distance equal to the extended height of the mast away from power lines.
- Any objects that might obstruct motion of the Mast System, cause binding, or hinder Mast System function are removed.
- The Night Scan Universal Remote Control System is properly installed.
- All electrical cables are undamaged and properly terminated.
- That the vehicle is not moving and is on level terrain.
- Any transit tie-downs have been removed.
- The Mast System area is free of personnel.
- The operator has full view of the Mast System during use.
- Ensure that the following precautions are understood and followed:

**⚠ WARNING**

**Mast Extension Hazard!** Extending mast into obstructions could result in death or serious injury and could render the mast inoperable and partially extended. Before applying power and operating the mast, be certain there is sufficient clearance above and to all sides of the expected location of the fully extended mast and payload. Keep all persons clear of mast and mast extension. Do not lean directly over the mast.

**⚠ WARNING**

**Relocation Hazard!** Relocating the mast during operation or after extension could result in death or serious injury. Do not relocate the mast during operation or while extended. This applies especially to masts mounted to vehicles. Operate the mast only if the vehicle is stationary and the vehicle engine is off.

**⚠ WARNING**

**Safety Instruction – Operation!** For outdoor use only. Do not use in areas that have been classified as hazardous as defined in Article 500 of the National Electric Code.

**⚠ WARNING**

**Safety Instruction – Keep Clear!** Keep personnel clear of the Mast System during operation.

**⚠ WARNING**

**Fire Hazard!** Do not use in the presence of flammable gases or liquids such as paint, gasoline or solvents. Do not use in areas of limited ventilation or where high ambient temperatures are present. Contact with combustible materials can cause ignition resulting in fire or explosion.

**⚠ CAUTION**

**Equipment Damage – Obstruction!** Check for and remove any objects that might obstruct motion, cause binding, or hinder function of the Mast System. Hitting obstructions will cause damage to the mast.

**⚠ CAUTION**

**Equipment Damage – Deviation!** Deviation from standard operating conditions and procedures could cause system failure.

## 3.2 Operation Equipment

Table 3-1 lists recommended equipment for operation.

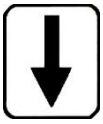
*Table 3-1 Equipment Recommended for Operation*

| Recommended Equipment* | | | |
|---|---|---|---|
| Personal Protective | | | |
| | Safety Glasses | Safety Gloves | Safety Shoes |
| | Hearing Protection | Hard Hat or Helmet | |
| * Depending on the local, regional, and national standards and codes of practice, and the environment, additional personal protective equipment may be necessary. | | | |

## 3.3 Wireless HHRC Controls

Using the Wireless HHRC, the operator can move the mast up and down, tilt the lights up and down, pan the lights right and left, turn the lights on and off, and turn the optional strobe light on and off. Figure 3-1 shows the buttons.


*Figure 3-1 Wireless HHRC*

| Symbol | Function | Symbol | Function |
|---|---|---|---|
|  | **E-STOP Button.** If an emergency stop is required at any time, press the E-STOP button. This will disconnect power from the unit and cause all air to be exhausted from the mast. |  | **Charging LED.** Blue LED blinks while charging. Solid Blue when fully charged. |
|  | **Signal LED.** Green LED blinks when signal is acquired.<br><br>Note: The Wireless HHRC is not ready until the ON Button is held. |  | **Low Battery LED.** Blinks when the battery is getting low. |
|  | **On/Start Button.** Turns the system on. |  | **Off Button.** Turns the system off. |
|  | **Mast Up Button.** Extends the mast.<br><br>Note: For fold-down units, quickly pressing twice will activate the Auto-Up feature to move the mast to 90° and turn on both banks of lights. |  | **Mast Down Button.** Retracts the mast.<br><br>Note: For fold-down units, quickly pressing twice will activate the Auto Stow® feature which will move the RCP to the home position, lower the mast to 90°, turn off any lights, and stow the mast. |
|  | **Pan Left Button.** Pans the mast left. |  | **Pan Right Button.** Pans the mast right. |
|  | **Tilt Up Button.** Tilts the lights up. On Dual-Tilt systems the left button tilts the left light bank and the right button tilts the right light bank. On single-tilt systems, both buttons tilt both light banks. |  | **Tilt Down Button.** Tilts the lights down. On Dual-Tilt systems the left button tilts the left light bank and the right button tilts the right light bank. On single-tilt systems, both buttons tilt both light banks. |
|  | **Auxiliary 1 Button.** Toggles Auxiliary 1 on and off. Operates the optional strobe/beacon light (if equipped). |  | **Auxiliary 2 Button.** Toggles Auxiliary 2 on and off. For future use. |
|  | **Light Button.** Toggles the lights on and off. On Dual-Tilt systems, the left button toggles the left light bank and the right button toggles the right light bank. On Single-Tilt systems, both buttons toggle both lights. |  | **Alphanumeric Display.** Shows the mast status and error codes. |

## 3.4 Junction Box Controls

| Symbol | Function | Symbol | Function |
|---|---|---|---|
|  | **E-STOP Button.** If an emergency stop is required at any time, press the E-STOP button. This will disconnect power from the unit and cause all air to be exhausted from the mast. |  | **START Button.** Turns the system on. |
|  | **WIRELESS.** Selecting WIRELESS switches control functions to the Wireless HHRC. |  | **TETHERED.** Selecting TETHERED switches control to the optional Wired HHRC. |

## 3.5 Quick Reference

The following is a quick summary of operation of the Night Scan using the Wireless HHRC. For detailed operation instructions, see your Night Scan operator's manual. If necessary, contact The Will-Burt Company to obtain this document.

**Emergency Stop**

If an emergency stop is required at any time, press the "E-STOP" button. This will disconnect the unit from power and cause all air to be exhausted from the mast.

Note: The "E-STOP" button on the Wireless Controller only works for wireless operation. For tethered operation, the "E-STOP" button on the Control Box must be used. The "E-STOP" button on the Control Box may be used for either wired or tethered operation.

To re-initiate, turn the "E-STOP" button to pop out the "E-STOP" button.

In general, to operate the Night Scan with the Wireless HHRC:

1. Ensure the vehicle parking brake is engaged.
2. Ensure there are no obstructions overhead.
3. Ensure the Selector Switch is in the "WIRELESS CONTROLLER" position.

   Note: For operation with the optional Wired HHRC, move the Selector Switch to the "TETHERED CONTROLLER" position.
4. Ensure the "E-STOP" buttons on both the Wireless Remote and Control Box are pulled out.
5. Press the green "START/ON" button until "READY" is shown on the Display.

6. For fold-down units, raise the mast to 90° and turn on the lights by performing one of the following steps:

   - Quickly press the "Mast Up" button twice (Auto-up feature) to move mast to 90° and turn both banks of lights on. To abort the Auto-up feature, press any controller button.
   - Press and hold the "Mast Up" button to raise the mast. Then press the "Lights" button to turn the lights on. The RCP will become active when the mast is at 90°. Only the controller buttons that have a lit LED are active.

   For vertical units, press the "Mast Up" button to raise the mast. Then press the "Lights" button to turn the lights on.

   The RCP will activate when safe operating conditions are met. The Display will list which functions are available.

7. If desired, raise the mast further by pressing the "Mast Up" button.
8. To position the light banks:

   - Vertically, press the "Tilt Down" button to rotate them down or the "Tilt Up" button to rotate them up. Note that in dual-tilt systems the light banks will rotate independently.
   - Horizontally, press the "Pan Left" button to pan them left or the "Pan Right" button to rotate them right.

9. If an optional strobe/beacon light is equipped, press the "Aux 1" button to turn the strobe/beacon on or off.
10. If desired, lower the mast by pressing the "Mast Down" button.
11. Stow the mast by performing one of the following steps:

    - Quickly press the "Mast Down" button twice (Auto Stow® feature). It is recommended to use the Auto Stow® feature to stow the mast. To abort Auto Stow®, press the any controller button.
    - Press and hold "Mast Down" until the Display turns off which indicates that the mast is stowed.

    The mast will automatically power off when the mast is stowed.

## 3.6 Wireless HHRC Charging

This section describes charging the Wireless HHRC. See Table 3-2 for information pertaining to electrical specifications for the system.

*Table 3-2 Electrical Specifications*

| Functional Characteristic | Specification* |
|---|---|
| Power Supply | 12 Volt (Constant) |
| Current Consumption | <15 mA (idle)<br>200-900 mA during charging (depending on supply voltage) |
| Charging Time | 2 Hours and 20 Minutes |
| Charging Temperature | 41°F to 113°F (5°C to 45°C) |
| Operation Time | Up to 40 hours of operation (depending on usage of LED and display) |

* Note:

- Communication frequency is U.S. legal. Customer is responsible for ensuring remote frequency is legal in country of use.
- Dimensions and specifications are provided for reference only and are not intended for vehicle design purposes.
- Specifications may be subject to change without notice.

**⚠ WARNING**

**Temperature!** During charging, the ambient temperature needs to be between 41°F and 113°F (5°C and 45°C).

To charge the Wireless HHRC, connect the Wireless HHRC to the battery charger on the Control Box (Figure 3-2). When the Wireless HHRC is charging, the blue Charging LED will blink. When the Wireless HHRC is fully charged, the blue Charging LED will be lit.


*Figure 3-2 Battery Charger*

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# Section 4 Maintenance

This section describes the routine maintenance and adjustment procedures required to keep your system operational.

## 4.1 Pre-Maintenance Check

Before performing maintenance procedures, ensure:

- All operators read and understand the entire maintenance procedure and are properly trained
- The system is level, secure, and stationary
- The following precautions are understood and followed:

**⚠ WARNING**

**Safety Instruction – Power!** Make sure all power has been disconnected prior to performing maintenance.

**⚠ CAUTION**

**Equipment Damage – Qualified Personnel!** All persons installing and maintaining this equipment should be suitably qualified and work to local, regional, and national standards and codes of practice.

## 4.2 Maintenance Equipment

Table 3-1 lists recommended equipment for maintenance.

*Table 4-1 Equipment Recommended for Maintenance*

| Recommended Equipment* | | | |
|---|---|---|---|
| Personal Protective | | | |
| | Safety Glasses | Safety Gloves | Safety Shoes |
| | Hearing Protection | Hard Hat or Helmet | |

* Note:

- Depending on the local, regional, and national standards and codes of practice, and the environment, additional personal protective equipment may be necessary.
- When disposing of any disposables or components, do so according to any applicable local, regional, and national standards and codes of practice.

## 4.3 Inspections

Table 4-2 lists inspections to be done periodically.

*Table 4-2 Inspections*

| Action | Frequency |
|---|---|
| Ensure that all safety-related functions including emergency stop functions work. | Daily (or immediately if suspicion of malfunction). |
| Inspect for damage. If damage is apparent, do not use the Night Scan Wireless Remote Control System and have it serviced prior to use. | As needed. |
| Inspect to ensure the Night Scan Wireless Remote Control System is kept clean and free from foreign material. If necessary, clean the Night Scan Wireless Remote Control System (Section 4.4). | As you work and as needed. |
| Visually inspect to ensure all hardware is in place. If hardware is found loose, retighten. | Monthly. |
| Visually inspect to ensure all cables are undamaged and properly terminated. | Monthly. |

## 4.4 Cleaning

This section describes cleaning the Night Scan Wireless Remote Control System.

**⚠ WARNING**

**Damage!** Never use acids, alcohol, or thinner when cleaning the Night Scan Wireless Remote Control System as these may dry up gaskets, significantly reducing the capacity to prevent water/moisture ingress. Never use high-pressure to clean the Night Scan Wireless Remote Control System as this may shorten the lifespan of the product or damage it.

As necessary, use a damp cloth to remove any debris from the Night Scan Wireless Remote Control System.

## 4.5 Wireless HHRC Pairing

This section describes pairing a Wireless HHRC with the Receiver in the Control Box. Typically, the Wireless HHRC will ship already paired to the Receiver in the Control Box. This procedure is only needed when replacing the Wireless HHRC or adding a second Wireless HHRC.

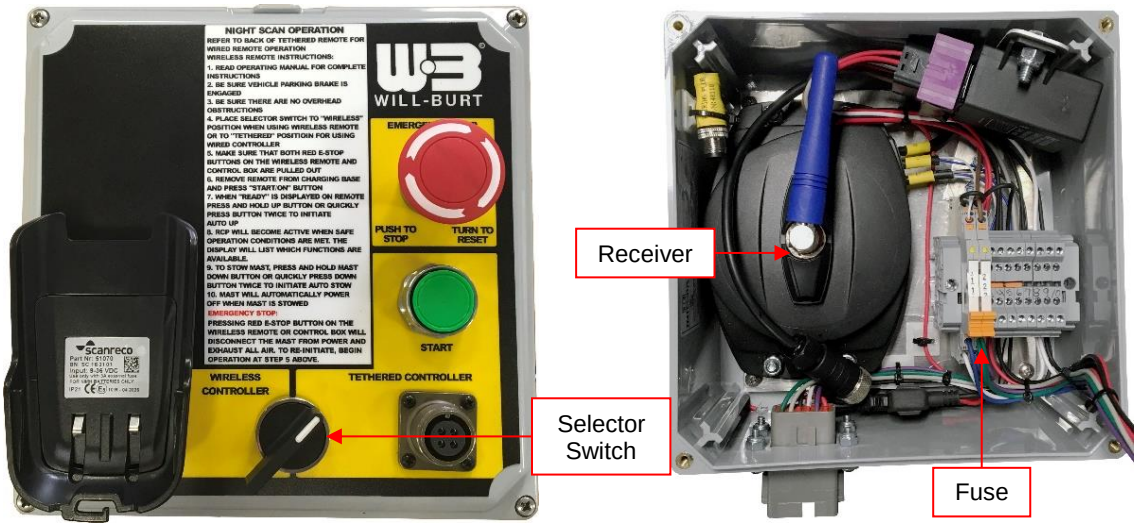
**⚠ WARNING**

**Safety Instruction!** If pairing is performed when the Wireless HHRC has a low battery, it may appear that the pairing works, however it may not work. Replace the battery and repeat the pairing procedure. This is related to a safety precaution.

To pair the Wireless HRHC:

1. Turn the Selector Switch to "TETHERED CONTROLLER" to remove power from the Receiver (Figure 4-1) and open the Control Box.

   Alternatively, open the Control Box and remove power from the Receiver by removing the fuse.




Selector Switch — Receiver and Fuse

*Figure 4-1 Remove Power to Receiver*

2. Assemble the Pairing Plug in the Control Box to the Pairing Plug Cord (Figure 4-2).

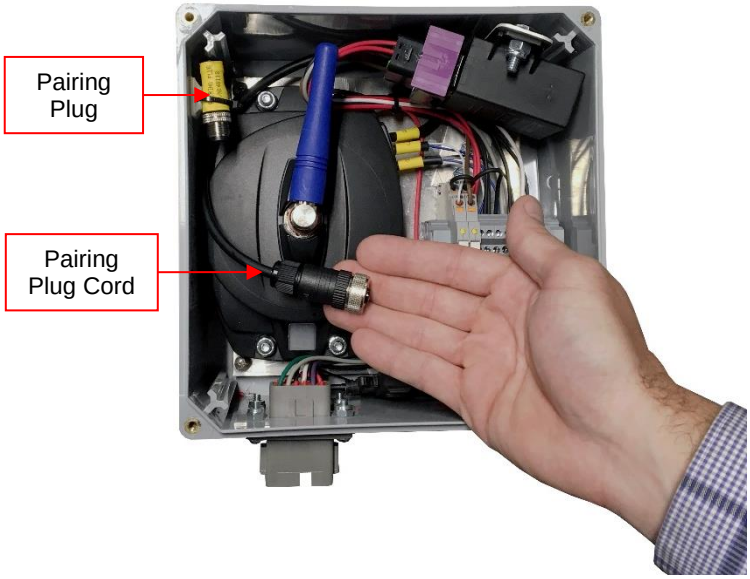



*Figure 4-2 Pairing Plug and Pairing Plug Cord*

3. Simultaneously press the Mast Up Button and the left-side Lights button (Figure 4-3). An LED will light indicating the Wireless HHRC is ready for safe pairing.

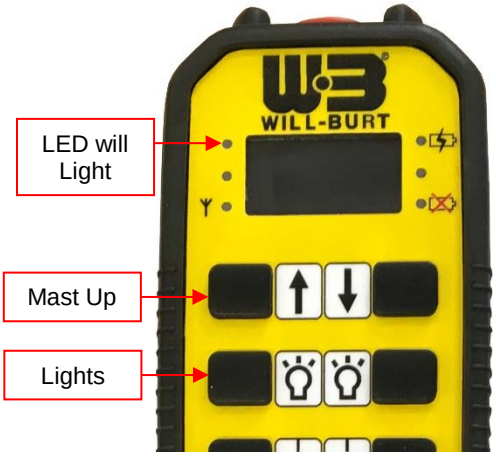



*Figure 4-3 Buttons and LED*

4. Re-apply power to the Receiver. This must be done within 10 seconds of step 3.

5. The Wireless HHRC will confirm the download is complete by flashing the LED eight times (Figure 4-4).


*Figure 4-4 LED*

6. The Receiver LED Display will flash "Po-Id" (Figure 4-5).

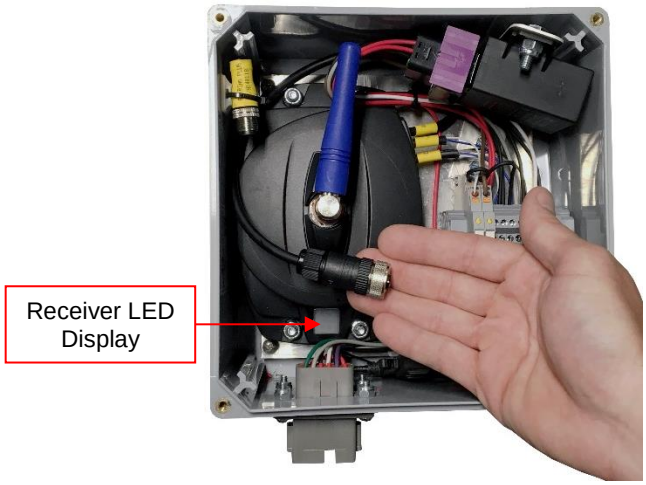



*Figure 4-5 Receiver LED*

7. Remove power from the Receiver. This can be done by removing the fuse inside the Control Box.
8. Remove the Pairing Plug.
9. Re-apply power to the Receiver and close up the Control Box.

## 4.6 Wireless HHRC Battery Replacement

This section describes replacement of the batteries in the Wireless HHRC.

**⚠ WARNING**

**Batteries!** If using non-rechargeable batteries, do not use the charger.

To replace the Wireless HHRC batteries:

1. Remove the belt clip by unscrewing the screws holding it in place.


*Figure 4-6 Remove Screws Securing Belt Clip*

2. Unscrew the four screws securing the lid and remove the lid.


*Figure 4-7 Remove Screws Securing Lid*

3. Remove the batteries.
4. Remove all dirt and dust to ensure not water can enter the unit.
5. Insert the new batteries being sure to check the polarity.
6. Reattach the lid.
7. Reattach the belt clip screws.

# Section 5 Troubleshooting

This section describes the troubleshooting of your system.

## 5.1 Troubleshooting Electrical

This section includes a list of warning and error codes and their potential causes. Warning codes do not halt the situation, but let you know of potential issues. Error codes point out problems and usually inhibit operation to prevent potential damage. These codes are shown on the status light on the Base Board. For example, an error of 3,07 would be shown on the status light as three flashes, pause, seven flashes. Additionally, if the controller for your system has a display, errors and warnings will typically be shown there. For more extensive information, see the Night Scan Product Troubleshooting Guide.

*Table 5-1 Base Codes*

| Message | Meaning | Root Issue | Potential Cause |
|---|---|---|---|
| WRN 1,04 | Look-Up light is burned out. | The control circuit is not sensing the look-up light current. | Look-up light is burned out or disconnected somehow. |
| WRN 1,05 | Well cover switches indicate closed when they should be open. This stops all vertical movement of the mast to prevent damage to the mast, covers, or load. | Well cover switches indicate closed when they should be open. | Wiring error, or defective switch. |
| WRN 1.06 | RCP Stow (Vertical, upper mag switch) – Sensor State Error. | Switch outputs are valid (opposite), but switch shows wrong polarity for nested state. | Defective mag switch, defective base board. |
| WRN 1,07<br><br>(Vertical Only) | At power up, the lower mag switch is indicating "up" (yellow) when it should be "down" (green). If you ignore the warning and continue, the mast will go up, but will shut down after a few seconds with an ERR 1,14. | The lower mag switch needs to be adjusted. D13 should be green when it "sees" the magnet | Wiring error, defective mag switch. |
| 1,01 | Mast Down (mag switch) - Sensor State Error. | This is only checked at power up, if stowed. Sensor outputs are O.K., but it is indicating that the mast is extended (not down). | 1. The magnetic sensor is not being energized or is defective.<br><br>2. Mag switch out of position. |
| 1,02 | Mast Stowed (near 0°) – Sensor Output Error | Sensor outputs are bad. | Defective sensor, defective board |
| 1,03 | Mast Stowed (near 0°) – Sensor State Error. | Sensor outputs are O.K., but sensor shows wrong polarity for nested state. The board remembers where it was (0° or 90°) when it was shut off, and this time it powered up, it's sensing the opposite condition. | Base board was changed or software was updated with the mast at 90°. |

| Message | Meaning | Root Issue | Potential Cause |
|---|---|---|---|
| 1,04 | Excessive amp draw during actuator decline | Current sensor indicating it has exceeded:<br><br>(12v systems) 10A for 100ms<br><br>(24v systems) 6.0 amps AND less than 10 amps for (100 msec) | If mast stops at ~70° and issues error, replace Base Board. Current sense circuit has failed.<br><br>If error occurs during nesting, check LED D7 "MAST STOWED (near 0°)". Once the sensor "sees" the magnet, it allows 0.5 sec to see the (nesting) current rise. If the circuit does not see the sensor, it does not look for nesting current to shut down. It will keep driving into the saddle and then issue a 1,04. Re-adjust Near 0° sensor.<br><br>Bad actuator – AC component in current wave shape due to internal mechanical problem. Replace actuator. |
| 1,05 | Well Open (Vertical with well cover) - Switch Output Error | Sensor outputs are bad. | Defective switch or wiring error. Refer to System Wiring Diagram. |
| 1,06 | Well Open (vertical with well cover) - Switch State Error. | Switch outputs are O.K., but show wrong polarity for closed state. | Well cover open or wiring error. System is expecting the well cover to be closed at power-up. |
| 1,07 | Microprocessor Error | No successful poll / response communication for 250ms. | |
| 1,08 | Internal firmware detected error. | Internal state machine logic has detected an invalid state transition. Firmware logic error. | |
| 1,09 | Initiate Pushbutton input error. | Init input has remained active for 5 seconds. Input is stuck, or has been hot-wired. | 1. Unit is in NFPA mode and connected to a Non-NFPA J-box. (Note: if the unit is in Non-NFPA mode and connected to an NFPA junction box, the unit will look normal (UP led on HHRC on), but will not respond to the HHRC. The software is expecting to see the init signal always on. No error message is generated).<br><br>2. Wiring short in the control cable or defective switch/wiring in the junction box. |
| 1,10 | Memory Error | Memory Error | Memory Error |
| 1,11 | Actuator current has unexpectedly stopped | During decline, the Base board senses actuator current. After the "Near 0°" sensor is detected, it is expecting to see the current level rise before it stops. This error indicates the sensed current has stopped before nesting. | If it occurs near the nested position:<br><br>Actuator has reached its internal stop before nesting completed, most likely saddle too low or saddle not secured causing sideways movement when nesting. |

| Message | Meaning | Root Issue | Potential Cause |
|---|---|---|---|
| 1,12 | Sensor Output Error<br><br>Roof-mount - Actuator at 90° magnetic sensor<br><br>Vertical - Upper magnetic sensor switch | Sensor outputs are bad. | Wiring error, faulty sensor<br><br>(Vertical only) mag switch positioning. Note: Sensor is only active as mast tube magnet goes by. Software watches for direction of travel and sensor activation to determine if mast is "up" or "down". |
| 1,13 | RCP STOWED magnetic sensor – Sensor Output Error<br><br>(Upper magnetic sensor on Vertical) | Sensor outputs are bad. | Wiring problem, defective magnetic sensor. |
| 1,14 | Mast Down (lower magnetic sensor)<br><br>1. Sensor Output Error<br><br>2. Sensor State Error | 1. Sensor outputs bad. They have not been opposite for >250ms.<br><br>or<br><br>2. Mast was told to go up, and the sensor indicates it did not move after 8 seconds (v7.2), or 15 seconds (v7.3).<br><br>3. Sensor is not seeing magnet when mast is fully retracted. | 1. There may be a wiring problem, or a defective magnetic sensor.<br><br>or<br><br>2. Defective magnetic sensor, air supply inadequate, or external magnet affecting sensor.<br><br>3. Sensor not seeing magnet - sensor needs to be re-aligned. |
| 1,15 | At 90° (Actuator) - Sensor State Error | Checked at power up after stowing. Sensor outputs are O.K., but sensor shows wrong polarity for nested state. | Board was changed or updated while the mast was at 90°. |
| 1,17 | Well Closed (Vertical with well cover) - Switch Output Error. | Sensor outputs are bad. | D7 Green = Closed<br><br>D8 Yellow = Not Closed |
| 1,18 | Well Closed (Vertical with well cover) – Sensor State Error | Switch outputs are O.K., but show wrong polarity for Well Closed. | Switch wiring, defective switch, board. |
| 1,19 | Both Near 0° and 90° - Sensor State Error | Both the Nested LS and the 90° LS have been detected active at the same time. This is an invalid condition, and indicates a problem with one or both sensors. | Both sensors indicate proximity, one may be bad. |
| 1,20 | Forced Stow has been activated | This fault is set when the Forced Stow switch is activated to assure the system is not in normal operation during the forced stow operation. | Forced Stow button has been activated |

*Table 5-2 RCP and Positioner Codes*

| Message | Meaning | Root Issue | Potential Cause |
|---|---|---|---|
| WRN 2,04 | Single-tilt - Tilt Stuck<br><br>Dual-tilt - Left Tilt Stuck | Checked only when moving out of a limit position. The software indicates the state of the (left) tilt photosensor has not changed even though the motor has been told to move for more than 1/2 second. | Something is preventing movement of left tilt mechanism, the motor is defective, or the RCP board is defective. |
| WRN 2,05 | Right Tilt Stuck | Checked only when moving out of a limit position.<br><br>The software indicates the state of the right tilt photosensor has not changed even though the motor has been told to move for more than 1/2 second. | Something is preventing movement of right tilt mechanism, the motor is defective, or the RCP board is defective. |
| WRN 2,06 | Pan Stuck | Checked only when moving out of a limit position.<br><br>The software indicates the state of the pan photosensor has not changed even though the motor has been told to move for more than 1/2 second. | Something is preventing movement of pan mechanism, the motor is defective, or the RCP board is defective. |
| 2,01 | Pan Limit Overlap | The software indicates both pan photosensors are blocked simultaneously. | Foreign material in one of the photosensors or faulty photosensor. |
| 2,03 (Positioner Only) | TILT pot stuck | No movement detected in expected direction for 2.0 seconds | Soft stops are not set, something is preventing the sense voltage (pot) movement, the motor is defective, the sense voltage is going the wrong way (miswire), or the P/T drive board is defective. |
| 2,04 (Positioner Only) | PAN pot stuck | | |
| 2,07 | Communication Timeout | The RCP or P-T Drive board has not sent out communications recently. | Bad board or connection in communications link. |
| 2,08 | Microprocessor error | The RCP board has sent an invalid message. | Indicates a software problem. |
| 2,09 (RCP Only) | (Left) Tilt Up wrap around | The software indicates the same photosensor was made before the opposite limit photosensor was made to stop rotation. This indicates wrap around. | 1. The flag that interrupts the light may need to be adjusted to go deeper into the photocell.<br><br>2. The limit photosensor is defective |
| 2,10 (RCP Only) | (Left) Tilt Down wrap around | | |
| 2,09 (Positioner Only) | Pan Pot Failure | The Positioner software indicates the pot feedback voltage is out of acceptable operating range. | Defective pot, incorrect wiring, bad connection, defective P-T board. |
| 2,10 (Positioner Only) | Tilt Pot Failure | | |
| 2,11 | 2,11 Right Tilt Up wrap around | The software indicates the same photosensor was made before the opposite limit photosensor was made to stop rotation. This indicates wrap around. | 1. The flag that interrupts the light may need to be adjusted to go deeper into the photocell.<br><br>2. The limit photosensor is defective |
| 2,12 | 2,12 Right Tilt Down wrap around | | |

| Message | Meaning | Root Issue | Potential Cause |
|---|---|---|---|
| 2,13 | 2,13 Pan Right wrap around | The software indicates the same photosensor was made before the opposite limit photosensor was made to stop rotation. This indicates wrap around. | The limit photosensor is defective. |
| 2,14 | 2,14 Pan Left wrap around | | |
| 2,15 | Left Tilt Limit Overlap | The software indicates both tilt photosensors appear to be blocked simultaneously. | Foreign material in one of the photosensors or faulty photosensor. |
| 2,16 | Right Tilt Limit Overlap | | |

*Table 5-3 HHRC Codes*

| Message | Meaning | Root Issue | Potential Cause |
|---|---|---|---|
| WRN 3,02 | Dual HHRC simultaneous inputs | Two HHRCs are sending commands simultaneously.<br><br>If commands are not conflicting, they will be allowed (Base Board decides).<br><br>If commands are conflicting, no action/movement will be allowed by the Base Board.<br><br>Warning appears regardless of conflicting or not conflicting to alert operators that someone else is trying to operate the unit simultaneously. | |
| 3,07 | Unrecoverable Communication Error | The display board in the HHRC or PMRC has power, but the Base Board is not communicating with it. It may be caused by the HHRC, Base Board, RCP Board, or any other device that is using the RS-485 communication lines in the system.<br><br>On an error, the Base Board stops the program, sends out the error code to the display devices and 'flashes' the code on the Base Board LED. Because one error can cause others to follow, the only code that is displayed/flashed is the first one that occurs. Other errors may happen after that, but they are not displayed. The idea is to show the actual initial problem, rather than any potentially confusing follow-on errors. | Defective HHRC or defective base board. Bad or improper connection in communications link, or HHRC is not properly powered. Check continuity of the data lines from the DC power cable connector to the HHRC connector. Refer to System schematic. Also check that the shield in the junction box has a good electrical connection to the electronics common at one end or the other, but not both. |
| 3,08 | Microprocessor Error | Internal firmware detected error. | Replace HHRC or HHRC Display pcb. |
| 3,09 | RF module Error | Wireless Transmitter/Receiver did not properly initialize. | Return HHRC to factory for repair. |

*Table 5-4 D-TEC Sensor Board Codes*

| Message | Meaning | Root Issue | Potential Cause |
|---|---|---|---|
| 5,01 | Lamp Fault | The D-TEC has sensed a fault in the LED lamp circuit. | This check is made when the mast thinks it has just arrived at 90º. The D-TEC Sensor measures the current through the look-up LED's to see if it is within a certain range. If it is not, the fault occurs. |
| 5,03 | SPI Fault | A communications bus internal to the D-TEC sensor has failed during self-test. | Defective Sensor |
| 5,07 | Unrecoverable Communication Error | No successful communication for 250ms. | Check connection (data lines, ground) for continuity.<br><br>This error may also be displayed on systems without a D-TEC if the Base Board is missing the 4710801 DIP Switch Shunt Board. |
| 5,09 | E-Field Fault | E-Field portion of the D-TEC failed its self-test. | Defective sensor |
| 5,10 | H-Field 1 Fault | One axis of the Magnetic Field portion of the D-TEC failed its self-test. | Defective sensor |
| 5,11 | H-Field 2 Fault | One axis of the Magnetic Field portion of the D-TEC failed its self-test. | Defective sensor |
| 5,12 | H-Field 3 Fault | One axis of the Magnetic Field portion of the D-TEC failed its self-test. | Defective sensor |
| 5,16 | Supply Voltage Fault | The power supply section of the D-TEC sensor is outside proper operational limits. | Check power connections, voltage level and induced noise on power source. |

*Table 5-5 Wireless J-Box and Wireless HHRC Codes*

| Message | Meaning | Root Issue | Potential Cause |
|---|---|---|---|
| 8,07 | Unrecoverable communication error | No successful poll / response communication for 250ms. | J-Box is not 'talking' to any other board. Check Base Board flashes and HHRC display for x,07. |
| 8,08 | Internal firmware detected error | Internal state machine logic has detected an invalid state transition. | Firmware logic error. |
| 8,09 | RF module error | XBee plug-in module did not properly initialize. | Bad module. |
| 8,10 | Memory Error | Memory Error | |
| 8,11 | HHRC power up negotiation failed | Unit could not establish communication with any HHRC (wired or wireless) when the NS 3.0 / 4.5 was powered up.<br><br>Panel Mount = unit 3, Wireless HHRC = unit 6, J-Box = unit 8.<br><br>System can have a panel mount remote and an HHRC, or 2 HHRCs, but never 3 remote units.<br><br>Negotiation happens every time the Base unit is powered up w/push-pull switch. | Wireless HHRC is not plugged in during "Pull to Start" power-up. |
| 8,12 | In-system reprogramming failed | Dip-switch activated in-system reprogramming of attached devices was not able to successfully complete. | |

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